Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Connect America Fund	)	WC Docket No. 10-90
	)	
ETC Annual Reports and Certifications	)	WC Docket No. 14-58
	)	

To: The Commission

PETITION FOR RECONSIDERATION OF HUGHES NETWORK SYSTEMS, LLC

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Pursuant to Section 1.429 of the Commission's Rules, Hughes Network Systems, LLC ("Hughes") respectfully request that the Commission reconsider the Order and Order on Reconsideration issued in the above referenced proceedings,[1] which failed to analyze the practical impact of different weighting levels on bidders' abilities to compete meaningfully in the reverse auction. Specifically, the current weighting scheme provides such an overwhelming advantage to bids from fiber broadband providers that it effectively excludes satellite broadband providers from participating and limits competition among platforms. As a result, it would thwart the Commission's laudable objective of extending the most cost-effective broadband services to the most eligible households. It also violates the principle of competitive and technological neutrality that undergirds decades of Commission universal service policies. There is no valid policy reason to provide such an overwhelming advantage to extremely high-speed or low-latency bids, given that consumer satisfaction data for satellite broadband service is in the same range as for terrestrial broadband technologies. The Commission should reconsider its

[1] *Connect America Fund; ETC Annual Reports and Certifications*, Report and Order and Order on Reconsideration, 32 FCC Rcd 1624 ("Order"), available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-17-12A1_Rcd.pdf.

Order in this proceeding and adopt a bid weighting matrix that provides a latency penalty of no more than 10 and maximum weights of 25 for 10/1 service, 15 for 25/3 service, 10 for 100/20 service, and 0 for Gigabit service.

Hughes is the largest satellite broadband provider in North America, serving over one million users, including those in rural, remote, and tribal areas[2]— those parts of the country that terrestrial broadband providers have left behind. EchoStar XIX, the world's highest-throughput satellite, entered into commercial service on March 16, 2017, making Hughes the first and only U.S. satellite Internet service to offer FCC-defined broadband speeds across the continental United States.[3] With a speed capacity of over 150 Gbps and over 130 Gbps forward capacity, EchoStar XIX currently provides broadband-defined speeds of 25/3 Mbps for residential users and 55/5 Mbps for enterprise users from coast-to-coast. With the addition of EchoStar XIX, Hughes is now able to offer more than double the capacity of its previous two-satellite configuration to consumers across the United States and deliver the high quality broadband services to Americans. The attached White Paper, "Evolution of Hughes Network Systems LLC's Broadband Satellite Services from Narrowband to FCC-Defined Broadband Speeds," describes in greater detail the stunning progress that Hughes has made in bringing higher speeds to greater numbers of customers in the U.S. Hughes is also evaluating various initiatives which

[2] The Tauri Group, *State of the Satellite Industry Report*, Satellite Indus. Ass'n (Sept. 2016), http://www.sia.org/wp-content/uploads/2017/03/SSIR-2016-update.pdf.

[3] *HughesNet Gen5 High-Speed Satellite Internet Service Now Available via GSA Schedule*, Yahoo! Finance (Mar. 30, 2017), http://finance.yahoo.com/news/hughesnet-gen5-high-speed-satellite-130000395.html.

will continue this evolution and provide even greater capacity and higher speeds to its U.S. satellite broadband consumers.[4]

I. THE WEIGHTING SCHEME IN THE ORDER SEVERELY LIMITS SATELLITE PARTICIPATION IN CAF PHASE II

The Commission's stated goal in the Order was appropriate – to craft a bid weighting system in which "every bidder has the opportunity to exert competitive pressure on all other bidders."[5] Specifically, the Commission set out to create a system in which bids at lower speeds and usage allowances "will still have the opportunity to compete for support, but will have to be particularly cost effective to compete with higher tier bids," but where "bids placed in higher tiers will not necessarily win because of the generally greater costs of deploying a higher capacity network at higher speeds."[6]

Unfortunately, however, the weighting matrix in the Order places such a heavy thumb on the scales in favor of low-latency, high-speed bids that such bids will always "necessarily win." Other bidders – and satellite bidders in particular – will not be able to compete effectively in the auction.

To illustrate the overwhelming nature of the penalties that the Order's weighting matrix imposes on baseline bids with higher latency, consider some examples in a hypothetical bidding area where the reserve price is $250. This was the top end of the costs that the FCC was willing to support in the CAF Phase II offers of model-based support, and so it probably represents a reasonable approximation of a potential reserve price in the CAF Phase II auction. The examples

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[4] Andrew Burger, *HughesNet Claims First FCC Broadband Defined 25 Mbps Satellite Broadband Service*, Telecompetitor (Mar. 7, 2017), http://www.telecompetitor.com/hughesnet-claims-first-fcc-broadband-defined-25-mbps-satellite-broadband-service/.

[5] Order at ¶ 21. *See also infra* Section II.A. (discussing the importance of economic efficiency in the bid weighting mechanism).

[6] Order, 32 FCC Rcd at 1634 ¶ 27.

also utilize Hughes's data, submitted in the record, showing that satellite providers are likely to require a subsidy of about $185 per month in order to subsidize the very high capacity requirements imposed by the CAF rules, which are well above the capacity limits on retail satellite broadband offerings in the market today.[7]

Suppose, then, that a fiber-based provider makes a bid in the Gigabit tier at the reserve price of $250, which would be scored at 100 based on its percentage of the reserve price. Assume further that the fiber-based bid is competing against a satellite bid of $187, which would be scored at 74.8 based on its percentage of the reserve price. The table below demonstrates the results under two scenarios. Scenario A is the framework in the Order in which a positive weight of 45 applies to bids in the 25/3 Mbps baseline service tier, a positive weight of 15 applies to bids in the 100/20 Mbps, and no positive weight applies for Gigabit service, and high-latency bids additionally receive a 25 weight.[8] Scenario B illustrates the weighting system proposed herein, in which bids receive a 25 positive weight for 10/1, a 15 weight for 25/3, a 10 weight for 100/20, and a 0 weight for Gigabit service, and high-latency bids also receive a 10 positive weight.

[7] *See Ex Parte* Letter from Jennifer A. Manner, Senior Vice President, Regulatory Affairs for Hughes Network Systems, Inc. to Marlene H. Dortch, Secretary, FCC, WC Docket No. 10-90 at 1-2 (filed Feb. 14, 2017) ("Hughes Weighting Ex Parte"), https://ecfsapi.fcc.gov/file/10214350922946/Hughes%20CAF2%20weighting%20data%20ex%20parte%20Final.pdf. This is discussed in more detail in Section II.C., *infra.*

[8] Hughes Weighting Ex Parte at 2.

Bidding Area ($250 Reserve Price)	**Satellite Bid ($187)** **74.80 =** Ratio ($187/$250 x 100)	**Fiber Bid ($250)** **100.00 =** Ratio ($250/$250 x 100)
Scenario A [The Order]	**+45 weight** for 25/3 Mbps **+25 weight** for latency Final Score = **144.8**	**No weight** for Gigabit **No weight** for latency Final Score = **100.00**
Scenario B [Hughes' Proposed Values]	**+15 weight** for 25/3 Mbps **+10 weight** for latency Final Score = **99.80**	**No weight** for Gigabit **No weight** for latency Final Score = **100.00**

As this table shows, Scenario B results in a fair outcome in which, in a bidding area with high costs at the upper limit of the amounts considered for CAF Phase II model-based support, a satellite bid near the floor for potential satellite bids will just barely beat a fiber bid. By contrast, the Order's weighting system used in Scenario A, proposing weights of 65 for 10/1 Mbps, 45 for 25/3 Mbps, 15 for 100/20 Mbps, and 0 for 1 Gbps/500 Mbps and a 25 positive weight value for latency, excessively favors fiber bids, allowing them to score significantly below the lowest possible satellite bid even when their actual bid is at the reserve price.

Under the Order's weighting system, in an area with a $250 reserve price, any satellite bid in the baseline tier (25/3) would have to be $175 less than any fiber bid in the Gigabit Tier in order to *tie*. In other words, if the fiber bid at $250, satellite would have to bid $75 to tie and $74 to win. This is well below the monthly $185 in support that a satellite broadband provider would require to provide a CAF-compliant offering. Thus, the Order's assertion that its 25-point penalty for latency will create a scenario where a Gigabit bid "will not necessarily win"[9] is simply false.

[9] Order at ¶ 33.

II. THERE IS NO POLICY BASIS FOR THE WEIGHTING MATRIX IN THE ORDER

The negative outcome that will result from the Order's bid weighting matrix, in which an entire segment of the consumer broadband industry is severely restricted from participating in CAF Phase II, lacks any justification in fact or policy.

A. Excluding Satellite Broadband Providers Will Make CAF Phase II Less Efficient and Effective at Meeting the Needs of All U.S. Consumers for Broadband Service

In the Order, the Commission correctly set out to maximize bidder participation, without regard to technology, to engender robust competition among providers and platforms and to help ensure that unserved or underserved areas are served by the most efficient providers.[10] As Commissioner O'Rielly has observed, government support for broadband deployment "should be done in a way that does not harm competition in the marketplace, [and] prevents bureaucrats from picking winners and losers."[11]

This is important because it is the only approach that will lead to an economically efficient outcome, "providing households in the relevant high-cost areas with access to high quality broadband services, while making the most efficient use of the finite universal service funds."[12] The National Broadband Plan proposed, and the *USF/ICC Transformation Order* adopted, an approach of allowing the market to help identify the provider that will serve the area

[10] Order at 1665, Statement of Chairman Ajit Pai (The auction weights are "designed to give every bidder—no matter what technology they use—a meaningful opportunity to compete for federal funds, while ensuring the best value for the American taxpayer.").

[11] Commissioner Michael O'Rielly, *Federal Broadband Infrastructure Spending: Potential Pitfalls*, FCC (Feb. 1, 2017) ("O'Rielly Blog Post"), https://www.fcc.gov/news-events/blog/2017/02/01/federal-broadband-infrastructure-spending-potential-pitfalls.

[12] *See Connect America Fund; ETC Annual Reports and Certifications*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 5949 at ¶ 207 (May 25, 2016) ("FNPRM"), https://apps.fcc.gov/edocs_public/attachmatch/FCC-16-64A1_Rcd.pdf.

at the lowest cost.[13] As now-Chairman Pai explained, the Commission's goal in CAF is "to maximize the broadband bang we get for our universal service buck by establishing a flexible weighting system that should incentivize carriers to deploy faster service to rural America at the lowest possible price to the taxpayer."[14] The importance of avoiding picking winners and losers is highlighted by the continuing evolution of technologies used to provide consumer broadband access. Satellite broadband technology has made enormous progress in a very short time, as detailed in the attached White Paper, and progress continues apace. CAF Phase II should harness this innovation and capability rather than shutting it out.

To make the most efficient and effective use of a finite budget, any subsidy given to a broadband provider should be limited to "only what is absolutely needed to promote access."[15] However, as Commissioner O'Rielly presciently observed: "if the weighting skews the auction results such that a few communities receive [premium offerings, like] Gigabit service, but many more have no access at all, then the auction will have failed to deliver on our obligations of universal service."[16] In short, as he concludes: "I support the goal of providing consumers with high-quality broadband service, but as I've said before, 'we should buy fewer Lamborghinis and more Chevys.'"[17] If the Commission fails to reconsider this Order, it should be prepared to explain why more Americans are trapped on the wrong side of the digital divide.

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[13] *USF/ICC Transformation Order*, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663 at ¶ 179 (2011), https://apps.fcc.gov/edocs_public/attachmatch/FCC-11-161A1_Rcd.pdf.

[14] *Connect America Fund; ETC Annual Reports and Certifications*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 5949 at 6109- 10 (Statement of Commissioner Ajit Pai, Approving in Part and Concurring in Part), https://apps.fcc.gov/edocs_public/attachmatch/FCC-16-64A1_Rcd.pdf.

[15] O'Rielly Blog Post at 1.

[16] O'Rielly Partial Dissent at 1668.

[17] *Id.*

In addition to avoiding such market distortions, implementing a regulatory framework that "stress[es] technology neutral approaches to broadband connectivity" will also have the more equitable result of delivering "comparable service[s] across the nation," as Commissioner Clyburn has recently observed.[18] This aligns with the Commission's decades-old commitment to universal service policies that are technologically and competitively neutral.[19]

It is therefore important for satellite broadband providers to be able to participate meaningfully in the CAF Phase II auction. The current bid weighting matrix, which provides overwhelming and insurmountable advantages to high-speed, low-latency bids, will undermine an efficient or effective auction process.

B. The High Latency Penalty Lacks Any Basis in Actual Consumer Data

Despite the lack of any data showing that latency causes consumer dissatisfaction, materially affects consumers' broadband experience, or deters consumer adoption of satellite broadband, the FCC nonetheless has, in the words of one Commissioner, imposed an "unreasonably severe" 25 point "penalty on latency"—effectively punishing satellite providers, like Hughes, for the technological realities of their services.[20] Because this penalty was established "at the last moment" without separate public comment and with little to no reference to any supporting evidence, it is important for the Commission to reconsider the issue and

[18] *Commissioner Mignon Clyburn's #Solutions2020 Call to Action Plan – FINAL*, Public Notice (Mar. 27, 2017), http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0327/DOC-344081A1.pdf.

[19] *See, e.g.*, *Federal-State Joint Board on Universal Service*, Report and Order, 12 FCC Rcd 8776 at ¶ 48 (1997) (concluding that rules that minimize competitive and technological bias would "facilitate a market-based process whereby each user comes to be served by the most efficient technology and carrier").

[20] Order, 32 FCC Rcd at 1668, Statement of Commissioner Michael O'Rielly (approving in part and dissenting in part) ("O'Rielly Partial Dissent").

establish a weighting regime with a "factual basis" that has been refined through "the benefit of public comment."[21]

Satellite broadband customers are just as satisfied as the customers of other types of broadband providers,[22] notwithstanding the inevitable latency resulting from the data travel time to and from a geostationary satellite.[23] As the 2015 Measuring Broadband Report and the subsequent 2016 Broadband Progress Report conclude, "less interactive applications such as web browsing and video streaming" are "unlikely" to be affected by such "differences in average latencies across"—the types of applications that comprise the substantial majority of Internet traffic.[24] Indeed, video streaming alone already accounts for more than 60 percent of peak downstream traffic over fixed broadband facilities in North America,[25] and video streaming and

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[21] *Id.*

[22] *Ex Parte* Letter from L. Charles Keller, Attorney for Hughes Network Systems, Inc. to Marlene H. Dortch, Secretary, FCC, WC Docket No. 10-90 (filed May. 11, 2016) ("Hughes Ex Parte May 11, 2016"), https://ecfsapi.fcc.gov/file/60001841475.pdf ("Market research shows that satellite broadband customers are in the middle of the pack among all broadband customers in satisfaction levels. Data from Consumer Reports demonstrates that recent broadband consumer satisfaction surveys put ViaSat/WildBlue at or above the level of cable broadband and DSL."); Comments of ViaSat, Inc., WC Docket Nos. 10-90, 14-58, 14-259, at 5-6 (filed July 21, 2016) ("ViaSat CAF Comments") ("ViaSat's satellite broadband service … now has an overall user satisfaction rating that is on par with that of leading cable-based broadband service providers").

[23] *See Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, Report, 31 FCC Rcd 699 at note 162 (2016) ("2016 Broadband Progress Report"); *2015 Measuring Broadband in America: A Report on Consumer Fixed Broadband Performance in the United States*, FCC at 17 (2015) ("2015 Measuring Broadband Report"), http://data.fcc.gov/download/measuring-broadband-america/2015/2015-Fixed-Measuring-Broadband-America-Report.pdf.

[24] *See* 2015 Measuring Broadband America Fixed Broadband Report at 7 (noting that "differences in average latencies across all technologies are unlikely to affect less interactive applications such as web browsing and video streaming"). "Highly interactive applications" include VoIP calls, video chat, and online multiplayer games. *Id.* at 18. *See also* 2016 Broadband Progress Report ¶ 108.

[25] *See* 2015 Measuring Broadband Report at 7 note 3.

downloads together are predicted to grow to more than 80 percent of *all* consumer Internet traffic by 2020.[26] Moreover, the Commission's Mean Opinion Score ("MOS") requirement in the CAF Phase II rules further ensures that "only about 5 percent of traffic could be deemed 'latency-sensitive' for CAF II purposes."[27] Coupled with strategic investments in greater satellite capacity, rising upload/download speeds, broadening coverage across the continental United States, and advancements in network engineering, satellite broadband internet is an excellent, cost-effective product for its over 1.6 million U.S. residential broadband customers, and it continues to innovate and improve every day. It is therefore unsurprising that one leading satellite provider reports that a third of its current customer base had switched to its services from terrestrial broadband alternatives.[28]

C. "Splitting the Baby" Is Not Data-Driven Decision-Making

The only quantitative support offered in the Order for the bid weighting matrix is that "most parties" in the proceeding had proposed "increment values somewhere between 5 and 60,"[29] and the selected range of "increments of 15–30 between performance tiers" is the

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[26] Cisco, Cisco Visual Networking Index: Forecast and Methodology 2015-2020 at 14, White Paper (June 1, 2016), http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/complete-white-paper-c11-481360.pdf. *Accord. Connect America Fund; ETC Annual Reports and Certifications Petition of USTelecom for Forbearance Pursuant to 47 U.S.C. § 160(c) from Obsolete ILEC Regulatory Obligations that Inhibit Deployment of Next-Generation Networks*, Report and Order, 29 FCC Rcd 15644 at ¶ 23 (2014) ("We expect carriers planning upgrades to their networks today would take into account near term and future consumer demand.").

[27] *Ex Parte* Letter from John P. Janka, Counsel to ViaSat, Inc., to Marlene H. Dortch, Secretary, FCC, WC Docket No. 10-90 at 3 (filed Feb. 17, 2017); *accord. Connect America Fund; ETC Annual Reports and Certifications; Rural Broadband Experiments*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 5949 at ¶¶ 14-37 (2016).

[28] ViaSat CAF Comments at 6.

[29] Order, 32 FCC Rcd at 1632 ¶ 25.

midrange of those proposals.[30] This is not a decision driven either by data or by economics. Significantly, the Commission failed to take into account record evidence that the "lower bound for satellite providers' bids will be above $185 per customer per month in the 25/3 Mbps tier."[31] Hughes derived this number based on actual market pricing for high-capacity satellite services that Hughes offers in the consumer marketplace today. There was no data in the record to contradict Hughes's showing.[32]

With this information in mind, it readily can be determined that bidding increments above a 10 positive weight lead to insurmountable bidding obstacles for satellite providers at reserve prices anywhere near likely levels.[33] More detailed quantitative analysis is necessary to arrive at a bid weighting matrix that achieves the Commission's goals of a fair and efficient auction. As a result, the Commission's "split-the-baby" approach cannot be justified.

III. CONCLUSION

Based upon the foregoing, Hughes respectfully requests that the Commission reconsider its Order in this proceeding and decrease the latency penalty to no more than 10 and adopt a bid weighting matrix that provides a maximum weight of 25 for 10/1 service, of 15 for 25/3 service,

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[30] *Id.* at 1633 ¶ 27.

[31] Hughes Weighting Ex Parte at 2.

[32] Without providing any data, ViaSat baldly asserted that Hughes's data "does not apply" to it. Letter from John Janka, counsel to ViaSat, to Marlene Dortch, FCC, WC Docket No. 10-90 (filed Feb. 21, 2017) at 2. But ViaSat's standard price for a 50 GB/month plan (which is only one-third of the capacity required under CAF rules) is $110 per month at 25 Mbps. *See* WildBlue Excede "Liberty 50" Plan pricing with "Boost 25," available at http://www.wildblue.com/plan-results/liberty12 (visited April 6, 2017). ViaSat does not publish pricing for its "Freedom" 150 GB/month plan, and only markets it in low-demand areas. *See* "Excede Freedom: A Satellite Internet Plan Like No Other," available at http://www.exede.com/freedom/ (visited April 6, 2017).

[33] *See supra* Section I.

of 10 for 100/20 service, and of 0 for Gigabit service. This will allow CAF Phase II to bring the benefits of FCC-defined broadband speeds to more consumers and leave fewer American homes in rural and remote areas on the wrong side of the digital divide.

Respectfully submitted,

By: _____/s/_____

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Attachment

WHITE PAPER:

Evolution of Hughes Network Systems LLC's Broadband Satellite Services

From Narrowband to Federal Communications Commission -Defined Broadband Speeds[1]

April 2017

Introduction

Since the 1980's, satellite operators have been on the leading edge of providing data service globally. As demand for data services increased and customers required more capacity at greater speed, the satellite industry (like terrestrial providers) developed and deployed improved broadband technology. For over three decades, Hughes Networks Systems LLC (Hughes), a U.S. based company and the leading global provider of broadband services,[2] has been at the forefront of this effort, providing satellite-based high-speed broadband services to U.S. consumers, including commercial and government customers. What started as a service supporting narrowband data for tens of thousands of customers has grown into a network of three U.S. satellites specifically designed to meet the growing consumer need for broadband satellite services. Today, Hughes serves more than a million broadband subscribers, many in the most rural and remote parts of the United States. Thanks to Hughes and its competitors, U.S. customers have access to cost-effective high-speed broadband services across the country, even in rural and remote areas. To achieve this success, Hughes alone has invested billions of dollars—and it knows that continued success will require continued investment and innovation.

This paper examines the evolution of the technology, capacity, and use of the Hughes satellite network to serve its broadband customers. This evolution began with the use of leased capacity on general purpose Ku-band satellites that could support customers' basic data needs, and progressed through three generations of purpose-built, high-throughput broadband satellites to reach the point where users, across the United States, even in rural and remote areas, have access to broadband at speeds of 25/3 Mbps or more utilizing the Ka Band (18/28 GHz). Underlying this evolution are dramatic improvements in satellite technology and more efficient use of the spectrum resource. In less than a decade, Hughes has improved the efficiency of its satellites exponentially, achieving two orders of magnitude greater throughput in order to meet the bandwidth requirements of its network's users.

Hughes is continuously working to improve throughput and speed of its network in its next generations of broadband satellites to satisfy consumers' demands. As discussed herein, in order to do this, Hughes will need access to significantly more bandwidth (spectrum), largely in the Q and V bands (35-55 GHz) as well as continued access to the bands it operates today. This will ensure that satellite broadband remains an important competitive platform to deliver advanced broadband services, such as 5G, to U.S. consumers.

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[1] The authors are Jennifer A. Manner, Senior Vice President, Regulatory Affairs and Brennan Price, Senior Principal Engineer, Regulatory Affairs at Hughes Network Systems, LLC.

[2] Hughes is the largest provider of broadband satellite services in North America, serving over one million broadband subscribers as of December 31, 2016. Hughes has over 1,500 U.S. employees.

Demands for Higher Speeds and More Capacity Led to the Development of SPACEWAY® 3

Initially, Hughes and other fixed satellite service operators were able to meet the demands of consumers by providing access to leased satellite services using the Ku-band (12/14 GHz) spectrum. However, these Hughes data offerings in the mid-2000s had limited capacity as did terrestrial offerings. The HughesNet® HN7000S platform utilized compression and modulation technology available at that time (early versions of the DVB-S2 standard) to offer aggregate capacity of 1 Gbps. As late as 2007, the highest speed offered by a Hughes service plan was 1 Mbps. While that seems slow by today's standards, at the time it was well in excess of the 200 kbps standard used by the Federal Communications Commission (FCC) to define broadband services through 2008.[3]

Figure 1. HughesNet Prebroadband User Equipment

Hughes recognized the trend at that time for higher speeds and greater capacity. In order to meet market demand, it designed and constructed its first broadband satellite, SPACEWAY 3. This satellite operates in the Ka band, in which one gigahertz of spectrum is available to support satellite operations with properties that facilitate smaller spot beams and greater frequency reuse. Hughes increased its development of such spectrum management techniques to ensure that SPACEWAY 3 would help to address the anticipated increased customer demand for broadband services.

SPACEWAY 3: True Broadband Is a Reality for the First Time in Rural and Remote Parts of the Country

Figure 2. SPACEWAY 3

[3] *See Fifth Broadband Deployment Report*, 23 FCC Rcd. 9615, ¶ 2 (2008).

Hughes launched SPACEWAY 3 in 2007, and in 2008 it began to provide broadband service to consumers throughout North America. Subscribership quickly took off as customers came to appreciate the improved capabilities this satellite offered. Hughes initially offered services of up to 2 Mbps download speeds in 2008 and enhanced the offering to 5 Mbps in 2013. In 2008, less than half of all broadband services in the U.S. had speeds of 3 Mbps or more, and only 34 percent had speeds of 6 Mbps or more.[4] Thus, Hughes offered a competitive service which compares favorably to the customer experience of many wireline DSL customers even today.[5]

SPACEWAY 3 also achieved a much higher throughput than prior generation satellites by using a dynamic mesh spot beam downlink network employing the RSM-A standard.[6] The mesh spot beam network allows for higher throughput by reusing frequencies many times across the country in different satellite beams aimed at different locations. The satellite, which remains in service, has an overall capacity of 10 Gbps, an increase in capacity of nearly 80 times over the pre-broadband generation.

However, like the previous generation, Hughes knew that consumers' demands for higher capacity and speeds needed to be addressed, and it began designing and constructing its next generation satellite, JUPITER 1.

JUPITER 1

In 2012, Hughes launched its JUPITER 1 satellite which used advanced technology to deliver broadband speeds of up to 15/3 Mbps for the first time to consumers throughout the country, no matter where they were located. Here again, Hughes provided a level of service that greatly surpassed the Commission's definition of broadband at the time (4/1 Mbps).[7] In the first year of JUPITER 1 operation alone, Hughes saw a 33% increase in its customer base.

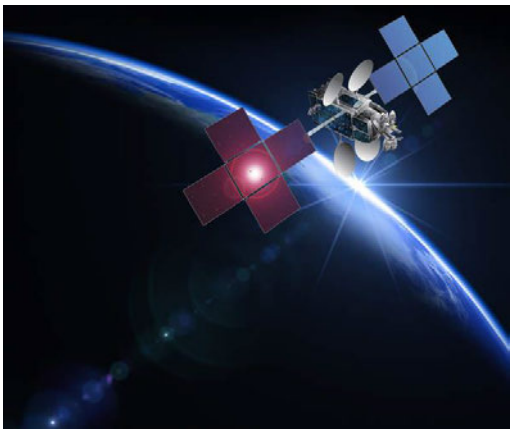

Figure 3. JUPITER 1

[4] *See High-Speed Services for Internet Access: Status as of December 31, 2008*, at 7 (Feb. 2010), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-296239A1.pdf.
[5] In practice, the best DSL speeds widely offered today are 1.5 Mbps downstream, with upstream speeds varying between 64 and 640 Kbps. *Asymmetric DSL*, *available at* http://computer.howstuffworks.com/dsl1.htm.
[6] RSM-A (ETSI TS 102 188), *Satellite Earth Stations and Systems (SES); Regenerative Satellite Mesh – A (RSM-A) air interface*, *available at* http://www.etsi.org/WebSite/homepage.aspx , 2004.
[7] *See Sixth Broadband Deployment Report*, 25 FCC Rcd. 9556, ¶ 5 (2010) (establishing 4/1 Mbps broadband standard).

JUPITER 1 utilized technological improvements—the DVB-S2 standard based on LDPC error correction (invented by Hughes) and 16APSK modulation—to achieve aggregate satellite capacity of 120 Gbps, a twelvefold increase in capacity over the prior generation satellite, as customer demands for high-bandwidth downloads continued to increase. JUPITER 1 has reliably performed well beyond Hughes' advertised broadband speed promises. In 2016, the FCC reported that Hughes provided its customers actual upload and download speeds of 195 and 152 percent of its advertised speeds.[8]

Recognizing the imperative to continue improving its service in order to meet market demand, Hughes once again moved quickly to address escalating requirements for capacity and speeds by designing a yet-more advanced satellite—JUPITER 2.

JUPITER 2: Delivering on the Promise of Broadband and Beyond to All

Figure 4. JUPITER 2 Launch, December 18, 2016

With more than a three-fold increase in customers in the past ten years, Hughes launched JUPITER 2 in late 2016 and placed the satellite in commercial service in early 2017. This satellite, along with the rest of the Hughes satellite network, is bringing consumers broadband speeds of 25/3 Mbps and more, which once again meets or exceeds the Commission's current definition of broadband.[9] This means that

[8] *See 2016 Measuring Broadband America Fixed Broadband Report*, chart 4, *available at* https://www.fcc.gov/reports-research/reports/measuring-broadband-america/measuring-fixed-broadband-report-2016.

[9] *See 2015 Broadband Progress Report and Notice of Inquiry on Immediate Action to Accelerate Deployment*, 30 FCC Rcd. 1375, ¶ 3 (2015) (establishing 25/3 Mbps broadband standard).

U.S. consumers, even in the most rural and remote areas of the country, have access to high-quality broadband service at rates comparable to terrestrial broadband.

JUPITER 2 utilizes the recently developed DVB-S2X standard, which improves upon DVB-S2 by adding higher-order modulation schemes, smaller roll-off factors, and improved filtering. These and other features combine to permit more spot beams across the country to support more overall users. The satellite achieves a total of 220 Gbps capacity—nearly double JUPITER 1.

Customer demand has grown as service offerings have improved, and Hughes expects this trend to continue as more customers use JUPITER 2. Today, Hughes offers competitive consumer plans with a 50 GB/month data allowance and a speed guarantee of 25/3 Mbps for $100/month, as well as an enterprise offering of 50/5 Mbps.

Broadband Satellite Has Pushed the Technical Envelope

Hughes has exploited advances in efficiency of spectrum use, modulation, and multiple spot beam technology to grow its business and provide a better quality of experience to its customers. The innovations are illustrated in the following chart.

Years	Platform(s)	Highest Satellite Capacity	Max Number of Spot Beams per Satellite	Max Service Mbps (Downlink)
2006-2007	Prebroadband	1 Gbps	1 (traditional transponder)	1
2008-2011	SPACEWAY 3	10 Gbps	24	5
2012-2016	SPACEWAY 3 + JUPITER 1	120 Gbps	60	15
2017	SPACEWAY 3 + JUPITER 1 + JUPITER 2	220 Gbps	138	50

This chart illustrates, from the prebroadband era to 2016:

- A 4900 % growth in the maximum download speed service offering.
- More than a two orders of magnitude growth in satellite capacity.
- A transformation from the single footprint satellite era to the high-throughput, multiple spot beam era, with more than 5 times more spot beams used for JUPITER 2 than for SPACEWAY 3.

These enhancements in capacity and customer experience have been enabled by coding improvements (culminating in the use of the DVB-S2X standard) and the use of multiple spot beam transponders, permitting multiple uses of the full Ka-band spectrum in the satellite's coverage pattern. These innovations on the JUPITER 2 system provide additional capacity for broadband Ka-band satellite services to our customers in North America, added capacity in Mexico and certain Latin American countries, and to add capability for aeronautical, enterprise, and international broadband services.[10]

[10] Hughes also recently launched a broadband satellite service in Brazil, and has additionally procured capacity on Telesat's new Telstar 19 Vantage satellite, scheduled for launch in the second quarter of 2018, to expand broadband satellite service in South America. *See* Press Release, "Hughes Launches Consumer Satellite

The Future

Hughes continues to pursue improvements in coding and spectral efficiency, but it is reaching a point of diminishing returns with respect to the spectrum it currently uses. Consumer trends toward ever increasing download speeds and throughput capacity require all wireless broadband providers, whether terrestrial or satellite, to utilize more spectrum to meet these expectations. The capability of available spectrum on the Ka band is essentially at its limit, necessitating migration toward the Q/V bands. Satellite operators are currently designing their next-generation satellites to operate in these bands.

Summary

The challenge for all of us is how to meet the growing demands of U.S. consumers for cost-effective, high-speed broadband connectivity no matter where they live or work. Satellite broadband is available today at broadband speeds recognized by the FCC to meet that call at rates comparable to terrestrial broadband services. For the approximately 34 million Americans in unserved and underserved areas,[11] it is unlikely that adequate terrestrial services will ever be deployed to meet their needs. However, satellite broadband has outperformed terrestrial in reaching these hard to reach areas on a timely and cost-effective basis. But in order for satellite providers to meet growing demands, they must have continued and increased access to critical resources, such as spectrum. Failure to ensure that this important resource is available to operators like Hughes would mean that the millions of Americans who live in the most rural and remote parts of the country would be deprived of the advanced services they need.

Internet Service in Brazil," (June 29, 2016), *available at* http://www.hughes.com/company/newsroom/press-releases/hughes-launches-consumer-satellite-internet-service-in-brazil; Press Release, "Hughes and Telesat Sign Agreement for High-Throughput Capacity on Telesat's New Telstar 19 VANTAGE Satellite Covering South America" (Nov. 11, 2015), *available at* http://echostar.com/NewsEvents/PressReleases/PressRelease.aspx?prid=31408.

[11] As of the last available FCC report, 33,981,660 Americans lack access to Fixed Advanced Telecommunications Capability. 2016 Broadband Progress Report, FCC GN Docket 15-191, Appendix D, p.66, *available at* https://apps.fcc.gov/edocs_public/attachmatch/FCC-16-6A1.pdf.